

21. Note on the Sternum of a large Carinate Bird from the (?) Eocene of Southern Nigeria. By C. W. ANDREWS, D.Sc., F.R.S., F.Z.S. (British Museum Nat. Hist.)*.

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(Text-figures 1-4.)

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The British Museum has recently received from Nigeria two small collections of vertebrate remains of great interest. The first, presented last year by Sir F. Lugard, G.C.M.G., was obtained in a cutting on the Port Harcourt railway in the Ombialla District, Southern Nigeria: in this the most important specimens are portions of the lower jaw of a primitive Zeuglodont, vertebrae of a crocodile, and numerous remains of fishes, including *Colerhynchus* and *Galeocерdo latidens*; a large number of Mollusca were also included. The second collection was sent by J. Eaglesome, Esq., C.M.G., and is from the same locality as the last; it includes further remains of the Zeuglodont, part of the sternum of a gigantic carinate bird, parts of the carapace of a leathery turtle, probably near *Psephophorus*, and some portions of skulls of Siluroid fishes. It is to the avian sternum alone that the present paper refers.

The age of the beds in which these fossils occur has not yet been definitely settled, but from the character of the vertebrate remains it was probably Eocene, and most likely the earlier part of that period. For instance, the presence of *Colerhynchus* ‡ and *Galeocерdo latidens* points to the Eocene age of the deposits, while the primitive creodont-like condition of the teeth of the Zeuglodont favours their reference to the earlier part of the period. The Mollusca have not yet been examined in detail, but Mr. R. B. Newton seems inclined to consider that they may indicate a somewhat later horizon.

The subject of the present note is the anterior part of the sternum; it was in two pieces, and the visceral surface was to a great extent concealed by a matrix of extreme hardness, which was difficult to remove. The anterior part of the keel and the body of the bone nearly to the level of the posterior ends of the

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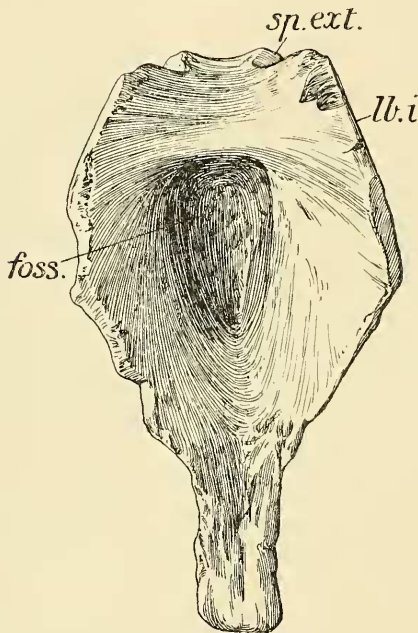
† [The complete account of the new genus and species described in this communication appears here; but since the name and a preliminary diagnosis were published in the 'Abstract,' No. 158, 1916, the genus and species are distinguished by the names being underlined.—EDITOR.]

‡ A. S. Woodward, Abstract Proc. Geol. Soc. No. 989 (1916), p. 51.

coracoid grooves are preserved, but behind this only a portion of the middle of the body is present, all the posterior expansion being broken away.

The middle portion of the anterior part of the visceral surface is hollowed out into a deep fossa (*foss.*) about 2.6 cm. wide, deepening and slightly narrowing from before backwards for about 4 cm., and then dying away posteriorly. This depression was probably connected with pneumatic foramina, opening into the base of the keel. In front of the fossa above described is a broad transverse

Text-figure 1.



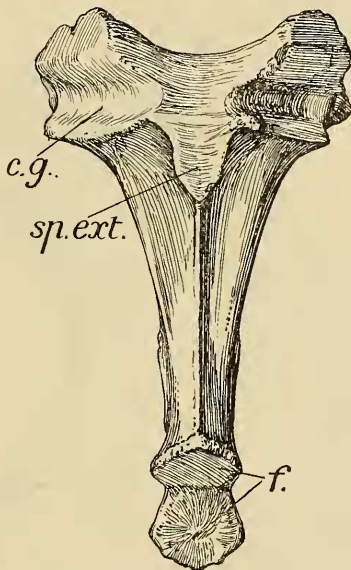
Sternum of *Gigantornis eaglesomei*, from above. $\frac{1}{2}$ natural size.

foss., fossa in visceral surface; *lb.i.*, labrum internum of coracoid groove;
sp.ext., spina externa.

ridge convex from before backwards and extending between the anterior ends of the prominences overhanging the coracoidal grooves; anteriorly this ridge is smoothly concave from side to side, there being no trace of a *spina interna*. The anterior ends of the coracoid grooves are separated by an interval of about 1.8 cm.; the grooves themselves are straight and deep and are overhung by a parallel convex surface (*labrum internum*, *lb.i.*). They make an angle of about 55° with one another and are about 7.7 cm. long, but their ventral lip begins to die away posteriorly

about 1 cm. from their hinder extremity; it is not possible to tell whether there was an accessory posterior coracoid groove as in the Petrels generally, that region of the sternum having been lost. Beneath and between the anterior ends of the coracoid grooves is a strongly developed *spina externa* (*sp. ext.*), the anterior escutcheon-shaped face of which was nearly vertical with regard to the long axis of the sternum; from its ventral angle a strong intermuscular ridge is continued down the anterior border of the carina, dividing it into two lateral surfaces and terminating at the upper border of the facet for articulation with the furculum. The carina itself is

Text-figure 2.



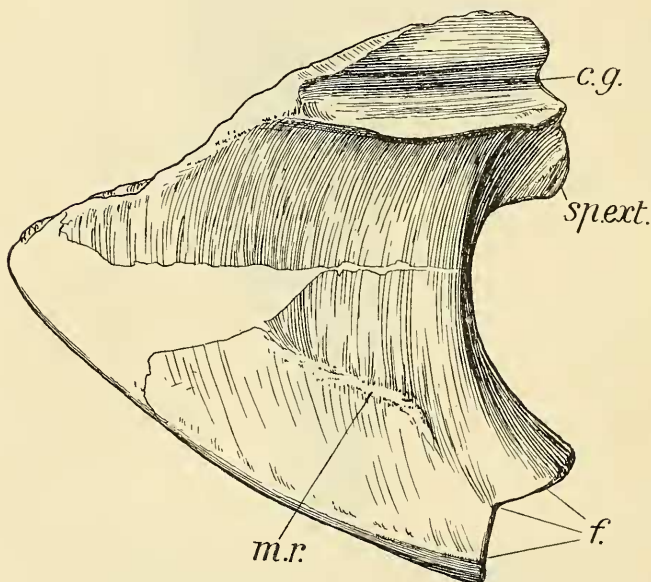
Sternum of *Gigantornis eaglesomei*, from front. $\frac{1}{2}$ natural size.

c.g., coracoid groove; *f.*, facet for furcula; *sp. ext.*, spina externa.

deep and is prolonged forwards and downwards; posteriorly it seems to have narrowed with exceptional rapidity, so that it may have been confined to the anterior portion of the body of the sternum, but, owing to the incompleteness of the specimen, its precise form cannot be determined. The anterior border is broad above and concave from side to side on either side of the median ridge above referred to; externally it is separated by sharp angles from the lateral surfaces. Lower down the anterior border narrows and becomes convex from side to side. The anterior angle of the carina, which projected rather strongly forwards, is truncated by an extraordinarily large surface for union with the

lower end of the furculum. This surface looks nearly directly forwards and is concave from above downwards; seen from the front (text-fig. 2) it is somewhat constricted in the middle, the constriction apparently separating distinct upper and lower articular facets, between which there is a roughened area; the upper facet is the more clearly defined, and the whole structure indicates the existence of an extremely strong union between the sternum and the lower end of a very large furcula. The ventral border of the keel is gently convex from before backwards, and also from side to side, the middle line being marked by a longitudinal intermuscular ridge. It is about 2.6 cm. wide in front, but narrows rapidly to about 1.5 cm.; further back the width becomes still further reduced.

Text-figure 3.

Sternum of *Gigantornis eaglesomei*, from side. $\frac{1}{2}$ natural size.

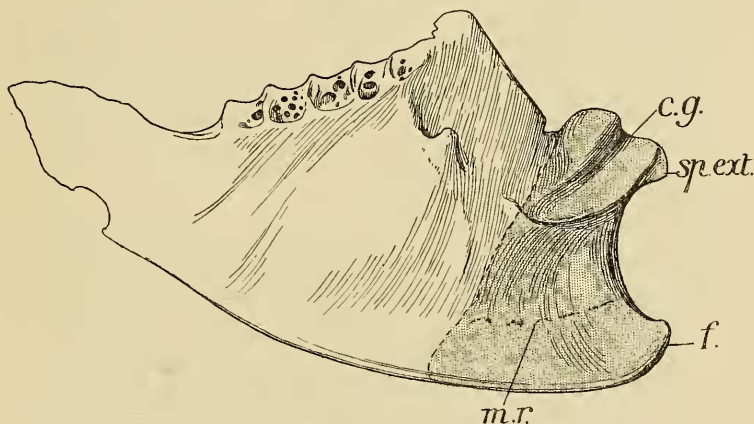
c.g., coracoid groove; *f.*, facet for furcula; *m.r.*, intermuscular ridge;
sp.ext., spina externa.

The lateral surface of the keel is slightly concave both from above downwards and before backwards; the concavity is most marked beneath the hinder end of the coracoid grooves, where the bone is very thin. The intermuscular ridge between the surfaces for the attachment of the *pectoralis major* and *pectoralis secundus* is extremely strongly developed. It commences about 2 cm. behind the middle of the clavicular facet, and for a short distance

runs upwards and backwards, then turns backwards; posteriorly it seems to have curved up in the direction of the posterior end of the coracoid groove; beneath the strongly developed ridge itself and connected with it are several roughened surfaces. The smooth sides of the keel are marked by numerous fine vascular impressions.

The chief peculiarities of this sternum, apart from its large size, are (1) the remarkable strength of its articulations with the coracoids and furcula, indicating the possession of an extremely powerful support for the wings; (2) the presence of a deep fossa on the visceral surface; (3) the very strongly marked intermuscular ridges. These characters seem to show that this bird was a powerful flier, and perhaps also a good swimmer and diver. It is undoubtedly generically distinct from any known species, and I have proposed for it the generic name *Gigantornis*, the specific name being *G. eaglesomei*, in honour of the discoverer [Abstract P. Z. S. 1916, p. 30 (May 30th)].

Text-figure 4.



Sternum of *Diomedea exulans*, from side. $\frac{1}{2}$ natural size.

Lettering as in text-fig. 3.

The stippled area indicates the portion preserved in the fossil.

This sternum has been compared with those of many recent birds, and it seems to resemble in some respects those of certain of the Tubinares and Steganopodes. The anterior aspect is much like that of the sternum of *Diomedea* (text-fig. 4), the form of the spina externa especially being almost the same; the disposition of the intermuscular ridges on the carina is also very similar. On the other hand, in *Diomedea* the coracoid grooves are more oblique, and their anterior ends are separated by a shorter interval; moreover, there is no deep fossa on the dorsal surface,

and, although the anterior angle of the keel widens out and was in contact with the furcula, there was no definite articulation between the two. In other members of the group, however, some of these characters are present. Thus, in *Procellaria* the dorsal fossa is present, and in the Diving Petrels (*Pelecanoides*) the furcula has a definite articulation with the anterior end of the sternum, and it seems possible that this articulation may in some way be connected with the diving-habit, since it is well developed in *Sula* and *Phalacrocorax*, both notable divers; on the other hand, *Fregata*, in which the furcula is actually fused with the sternum, seems never to dive. Comparison of the fossil with the sterna of *Sula* and *Phalacrocorax* in other respects, shows that in the depth and shortness of the keel and in the form and position of the coracoid grooves they are somewhat similar. On the other hand, the keel projects much more forwards, the spina externa is thin and compressed, there is no dorsal fossa, and the position of the intermuscular ridges on the keel is different.

Comparison with the sterna of other groups of birds has led to no satisfactory results. In the case of some of the Storks (e. g. *Argala*) the furcula has an extensive union with the anterior angle of the keel, but in other respects the form of the sternum differs from the fossil. The sterna of the Penguins and Auks also differ widely, the keel being very long and there being no union with the furcula. On the whole, we may conclude that *Gigantornis* was most nearly related to the Tubinares and Steganopodes, perhaps approaching the former more nearly, and it may, indeed, be the representative of an extinct group more or less intermediate between these two.

Further collections from the same locality are greatly to be desired, since nearly all the few specimens hitherto obtained represent forms new to science and of the highest interest.

Some dimensions (in millimetres) of the fossil are:—

Length of the portion of body preserved	136
Greatest depth from anterior upper border of body to antero-inferior angle of keel	140
Distance from anterior angle of coracoid groove to antero-inferior angle of keel	127
Length of coracoid groove..... (app.)	77
Distance between anterior ends of coracoid grooves	18
Depth of surface for furcula..... (app.)	45
Greatest width of surface for furcula.....	26
Thickness of lower border of keel at level of hinder end of coracoid grooves	12

Text-fig. 4 represents the sternum of a large Wandering Albatross (*Diomedea exulans*), which in the flesh measured 10 ft. 8 in. from tip to tip of the wings; the fossil sternum, so far as measurements are possible, seems to have been about twice as large.